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ABSTRACT

Children aged 2:0 to 4:4, including native speakers of English, Italian, Serbo-Croatian, and Turkish, were asked to demonstrate causative statements by acting them out with toy animals and dolls. The major analysis focused on the total number of correct acting-out responses and the way this score related to several variables. Performance improved with age within the range surveyed, but the rate of growth was not the same from one age period to the next. Children learning the two inflectional languages performed better than did children learning the two word-order languages. The superior performance of the Turkish-speaking children appeared to be related to the fact that Turkish inserts a particle in the verb to carry out this function, while the other languages express the causative with a periphrastic construction. The similarities and differences in performance growth curves also point to particular aspects of language development in the four languages. For instance, the Serbo-Croatian curve appears indicative of the children's difficulty in attending to both word order and inflectional cues. Continued errors at later ages are evident in both Italian and English, but the linguistic cause in each case is distinctive. In summary, the results suggest that sentence processing is aided by surface markings which identify the roles of particular words. (JB)

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A CROSS-LINGUISTIC STUDY OF THE PROCESSING OF CAUSATIVE SENTENCES[1]

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Children's comprehension of causative constructions was studied as one part of a large cross-linguistic investigation conducted in Berkeley, Rome, Dubrovnik, and Istanbul (Aksu 1978; Clancy, Jacobsen, & Silva 1976; Johnston & Slobin 1977; Radulovic 1975; Slobin 1978; Slobin & Bever forthcoming). Our overall concern is the effect of grammatical form on the developing ability to express basic concepts in language. The data consist of cross-linguistic differences in the rate and pattern of acquisition of the means for encoding notions of space, time, agency, and causation.

In the present study we are concerned with forms for the expression of instigative causation--that is, situations in which one agent impels another agent to act. English has a variety of means--lexical, morphological, and syntactic--for such expressions. Here we are concerned with the productive expression most accessible to children: the periphrastic construction using make as a causative verb, as in, "You made me do it." The four languages studied--English, Italian, Serbo-Croatian, and Turkish--have different means for the production of such expressions. The first three, all Indo-European SVO languages, have similar periphrastic constructions, differing in regard to the roles of word order and case inflection. By contrast, Turkish, an agglutinative SOV language, encodes causation by the insertion of one or more causative particles in the verb. Table 1 compares the productive causative expressions in the four languages, using one of the sentences from the investigation. Note that there are word-order differences among the three SVO languages--roughly: English: The horse makes the camel run; Italian: The horse makes run the camel; Serbo-Croatian: The horse makes the camel that (it) runs. In both English and Serbo-Croatian, the action verb appears at the end of the sentence, with the causative verb in the normal verbal position between the two nouns; in Italian the entire verbal construction remains in normal position. In English and Italian the causative verb (makes, fa) agrees with the subject in person and number, while the action verb is in the infinitive (run, correrre). In Serbo-Croatian a particle separates the causative clause from the action clause, and both verbs are finite. In addition, the case inflectional system marks the instigator as subject and the instigated as object. Also, the

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Table 1

Comparison of Causative Constructions in English, Italian, Serbo-Croatian, and Turkish

English					
The horse makes			the camel run.		
NOUN	VERB causative third person		NOUN	VERB infinitive	
Italian					
Il cavallo [the horse]	fa [makes]		correrre [to run]	il cammello. [the camel]	
NOUN	VERB causative third person		VERB infinitive	NOUN	
Serbo-Croatian					
Ždrijebe [horse]	tjera [drives]	devu [camel]	da	trči. [runs]	
NOUN nominative	VERB causative	NOUN accusative*	PARTICLE	VERB third person	
Turkish					
At [horse]	deveyi [camel]	koşturşun. [should make run]			
NOUN nominative	NOUN accusative	VERB causative optative third person			

* The noun in the example is feminine, and therefore has a distinct contrast between nominative (deva) and accusative (devu). Neuter nouns, like Ždrijebe, however appear in the identical form in both nominative and accusative. Sentences used in the study exhibited three types of noun combinations: neuter-feminine (object marking), feminine-neuter (subject marking), and neuter-neuter (neither).

causative verb in Serbo-Croatian (tjerati) is a specialized one, used to discuss driving animals and impelling action, whereas the English make and Italian fare are general verbs performing a large number of other functions. In terms of surface marking, therefore, Serbo-Croatian seems to provide the clearest cues of the three Indo-European languages. The Turkish causative retains standard SOV order, embedding a causative particle within the verb. The particle follows the verb root (agreeing with it in vowel harmony) and is followed by particles of person, number, tense, mood, and aspect (e.g., koş 'run' + -uyor 'third person' = koşuyor 'he/she runs'; + -tur- 'causative' = koşturuyor 'he/she makes (someone) run').[2] As in Serbo-Croatian, the case inflectional system marks the instigator as subject and the instigated as object. However, unlike Serbo-Croatian, Turkish has no grammatical gender and no exceptions to the regular inflectional paradigm. As a result, the object is always clearly marked in Turkish. In Serbo-Croatian, however, neuter nouns appear in unmarked form for both nominative and accusative, thus making it impossible to mark neuter direct objects inflectionally.[3] Turkish, then, provides clear surface cues for the causative, but of a different sort than the Indo-European languages. These contrasts between the four languages allow us to compare the roles of morphological (causative particle, case inflections) and syntactic devices (periphrasis, word order) in facilitating children's comprehension of causative constructions.

Very little work has been done on the development of these forms in child speech (Aksu 1975; Baron 1977; Bowerman 1974, 1977). The Turkish causative particle is used by children as young as 2;4 in free speech, and is overgeneralized at an early age. For example (Aksu 1975), Turkish has a lexical causative verb, sok-, meaning 'insert, make to go in'. Although this verb is already causative in meaning, a child of 2;8 added the causative particle to produce an inappropriate form, soktur-, indicating productive control of the causative morpheme. At about the same age in English, Bowerman (1974) reports the development of the periphrastic causative (e.g., I make it flat), along with overgeneralizations of transitive verbs as causatives (e.g., Eva, 2;4: Don't tight this 'make tight'). Although the evidence is limited, it is probably the case that children in all four languages hear instigative causatives frequently, and can use them productively sometime in the third year of life. In the present study we examine the ability of children between the ages of 2;0 and 4;4 to comprehend such constructions in an experimental task. Our major concern in this study lies in cross-linguistic comparison of

the course of acquisition of these constructions. Control of forms in free speech, supported by communicative intent, generally occurs at an earlier age than is demonstrated in formal comprehension testing, but this fact should not alter the language-specific development patterns which we seek.

METHOD

Subjects

The causative comprehension measure reported in this paper was one of 16 linguistic and nonlinguistic tests offered to matched samples of two-, three-, and four-year-olds in the four countries. Our plan was to study 48 children in each field site, in groups of three boys and three girls spaced at four-month intervals between the ages of 2;0 and 4;4. By and large, we completed this plan, though there are gaps in the data at various points, due to the tribulations of carrying out research in foreign countries within a limited time schedule. Table 2 presents a summary of the subject sample participating

Table 2

Number of Subjects Contributing to Causative Comprehension Data

Group	Age	Number of Children			
		English	Italian	Serbo-Croatian	Turkish
A	2;0 - 2;4	10	10	12	10
B	2;8 - 3;0	11	12	12	8
C	3;4 - 3;8	12	12	12	11
D	4;0 - 4;4	12	11	12	10
TOTAL		45	45	48	39

in this phase of the investigation. Since we were interested in cross-linguistic, not cross-cultural factors, we tried, as much as possible, to equate our samples on sociocultural grounds. That is, we limited ourselves to children of urban, professional parents, at least one of whom had a college degree. By and large, we feel that we were working with a fairly homogeneous group of children across the four field sites, at least

in terms of early material and intellectual experience. Each child was studied extensively, over a period of 15-20 hours, within a ten-day span. The causative task was administered midway in the series. The examiner was always female, and always a native speaker.

Procedure

Examiner and child sat at the same side of a table. The child was presented with a pair of toy animals or dolls and was asked to demonstrate an action instigated by one and carried out by the other (e.g., The horse makes the camel run). The child was already familiar with these animals from two sessions of a word order comprehension task (Slobin & Bever forthcoming), in which s/he was to demonstrate actions involving two animals and a reversible transitive verb (e.g., The horse kicks the camel). A pair of animals was introduced and named, and the relevant action was demonstrated for each animal separately (the camel can run, the horse can run). The child was then instructed to demonstrate the causative interaction. Each sentence was offered up to three times, in a medium flat intonation at normal speaking rate with equal stress on both nouns. If the child's response, after three presentations, remained unclear, s/he was probed by questions as to what each of the animals had done. A correct response required that the first animal instigate the action (either by direct contact with the second animal, or by verbal instruction uttered by the child for the sake of the first animal) and that the second animal carry out the action. Responses were counted as correct if, on questioning, the child attributed instigation to the first animal (e.g., The horse told the camel to run; The camel ran because the horse wanted him to; etc.). There were five classes of errors: (1) no response or unclear response, (2) reversal (e.g., The camel made the horse run), (3) both animals act separately, (4) only the first animal acts, (5) only the second animal acts.

Design

There were six causative configurations: horse makes camel run, dog makes cat swim, boy makes girl lie down, chick makes lamb jump, pig makes sheep walk, and goat makes zebra go to sleep. The order of the six configurations was always the same. For half of the children, the first participant listed in the examples above was the instigator; for the other half it was the second. To control for possible biases of physical placement of the animals, each instigator was placed an equal number of times to the right and to the left of the other

participant. The syntactic constructions of the stimulus sentences are presented in Table 1. In Serbo-Croatian, feminine nouns have distinctive nominative and accusative forms, whereas neuter nouns appear in uninflected form for both of these cases. In order to test for the effects of inflectional cues in this language, three kinds of participant pairings were used: (1) neuter-feminine (distinctive object marking), (2) feminine-neuter (distinctive subject marking), (3) neuter-neuter (subject-object relation signalled by word order with no inflectional cue).

RESULTS AND DISCUSSION

The major analysis focused on the total number of correct acting-out responses on the causative task and the way this score related to language, age, and sex. An interaction model analysis of variance was performed on the data. All factors (language, sex, and age) were between subject variables. Because the factor of sex of subject did not produce a significant overall effect, and did not interact with any of the other factors, it will not be discussed further. Instead of performing significance tests on the overall main effects and interactions, more specific questions were asked of the data by means of planned contrasts at each level of the analysis. Table 3 displays the various means, and Table 4 lists the significant main effect contrasts and significant interaction effect

Table 3

Mean Percentage Correct by Age and Language

Age Group	Language				Across Languages
	English	Italian	Serbo-Croatian	Turkish	
A	7	8	68	37	30
B	33	60	61	94	62
C	72	67	82	96	79
D	70	64	95	95	81
Across Ages	38	50	77	81	

Table 4

Significant Contrasts on Causative Comprehension Task

	df	F
Overall Age Effects[1]		
Linear improvement in performance with age (linear trend)	1	64.141
Simple departure from linear improvement with age (quadratic trend)	1	13.874
Overall Language Effects[2]		
Turkish-Italian	1	26.9547
Turkish-English	1	27.0358
Serbo-Croatian-Italian	1	17.1136
Serbo-Croatian-English	1	22.8410
Turkish & Serbo-Croatian - English & Italian	1	42.644
Turkish - Serbo-Croatian & English & Italian	1	14.048
Interaction Effects of Age and Language[3]		
Turkish-Serbo-Croatian in quadratic trend	1	8.1222
Serbo-Croatian-Italian in quadratic trend	1	8.0662
Subsidiary Analysis of Differences in Cell Means[4]		
Serbo-Croatian Age A - Italian Age A	1	19.9303
Serbo-Croatian Age A - English Age A	1	21.0593
Turkish Age B - English Age B	1	17.3993

1. Critical F' at α of .01 for 3 contrasts [α for each test = .0033] = 8.644
2. Critical F' at α of .05 for 8 contrasts [α for each test = .00625] = 7.5076
3. Critical F' at α of .09 for 18 contrasts [α for each test = .005] = 7.3961
4. Critical F' at α of .05 for 24 contrasts [α for each test = .002] = 9.4249

contrasts. It also presents the results of a subsidiary analysis on certain differences of cell means--the significant differences between pairs of languages at the various age levels. It should be noted that the criterion adopted for significance of each of the contrasts was fairly conservative, because of the number of tests performed.[4]

Age

The significant contrasts within the main effect for age indicate both a significant overall linear improvement in performance with age (linear trend) and a significant departure from this straight line improvement with age (quadratic trend). More simply, this means that performance on this structure is showing improvement within the age range surveyed, but that the rate of growth is not the same from one age period to the next. Consideration of the growth curves for each language in relation to the others further illuminates, as well as complicates, this overall nonlinear growth trend.

Language

Eight contrasts were made within the main effect for language. The languages marking the direct object of causation with an inflection (Turkish and Serbo-Croatian) were contrasted with the languages marking this case by word order alone (English and Italian). And the languages expressing the causative with a periphrastic construction (English, Italian, and Serbo-Croatian) were contrasted with Turkish, which inserts a particle into the verb to carry out this function. In addition, tests were performed on each of the six possible two-way pairings of the four languages. These tests produced two major findings.

First, children learning the two inflectional languages performed better overall on this task than did children learning the two word-order languages. Thus Turkish and Serbo-Croatian, both individually and together, have significantly higher means than English and Italian, taken either separately or together. And the Italian mean does not differ significantly from English, nor does Turkish differ overall from Serbo-Croatian.

There are a variety of factors which differentiate the two inflectional languages from the two word-order languages, and we are not in a position to pull them apart in this study. But what Serbo-Croatian and Turkish have in common, as opposed to English and Italian, is the presence of morphological particles

which may facilitate sentence processing strategies. Both have a direct object inflection. The Serbo-Croatian causative verb, tjera, serves a specialized function in the language, and in this sense is in some way similar to the Turkish causative morpheme, which is also specialized in function. The Serbo-Croatian action verb in the causative construction is finite and is separated from the rest of the sentence by a particle, da, which may also call special sentence processing strategies into play for this type of sentence, or at least serve to block strategies applicable to simple declaratives. Thus, in general terms, Serbo-Croatian and Turkish can be said to provide more local cues within the sentence, in contrast to English and Italian, whose sentence structures require that the listener hold the entire sentence in mind in order to determine the underlying semantic relations.

The second major finding relates to another way in which the four languages can be contrasted. English, Italian, and Serbo-Croatian express the causative with a periphrastic construction, while Turkish inserts a particle into the verb to carry out this function. And overall performance for Turkish was higher than that for the other three languages combined. Again, there are several possibilities for the superior performance of Turkish children on this task, but at least it is clear that the inserted particle construction is not more difficult than periphrasis. One might have expected the Turkish form to be more difficult, in that the verb conflates both the causing and the caused phases of the underlying semantic structure (Talmy 1976). That is, the two phases of action are not as obviously marked on the surface as they are in languages using periphrastic constructions. However, whatever the nature of early sentence processing strategies, this did not pose a problem for the Turkish children. In addition, it should be noted that Turkish has the advantage of a clear and exceptionless inflectional system, which is mastered before the age of two. In addition, the causative sentence follows normal SOV word order. Thus several factors may play a joint role in contributing to the precocious Turkish performance.

Language by Age

The interaction contrasts compared the growth trends across age for each pair of languages. Figure 1 portrays this language by age interaction. The two significant contrasts relate to the nonparallelism of some of the growth curves. The observed differences and similarities both point to particular aspects of language development in the four languages investigated.

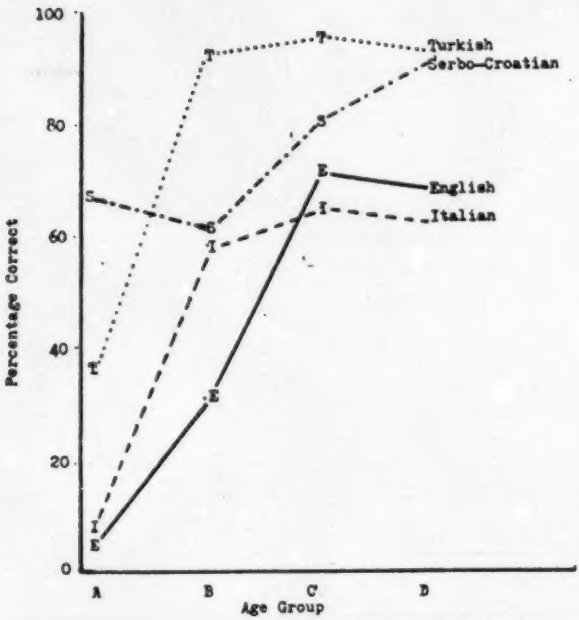

Figure 1. Percentage Correct by Age and Language

In this part of the analysis a significant difference can be seen between Turkish and Serbo-Croatian in the shape of the growth curves (the nonparallel quadratic components). While Turkish shows accelerated development between the first and second age periods and reaches an early ceiling, Serbo-Croatian starts out with a relatively high level of performance but improves more slowly. Though none of the differences in the means between Turkish and Serbo-Croatian at any age is significant, the rapid development in Turkish and the lack of Serbo-Croatian development at the second age level seem mostly responsible for this significant contrast in patterns of growth between the two languages.

Possible reasons for the shape of the Turkish growth curve have already been discussed, but the Serbo-Croatian developmental pattern needs further examination. Several sorts of

evidence suggest that at this second age level the Yugoslav children begin to have difficulty attending to both word order and inflectional cues. Although word order and inflection never present contradictory information in this task (that is, the second noun is always the direct object, whether inflectionally marked or not) in the language in general, inflectional marking allows for nonstandard word orders. It seems that at the second age level, the children begin to be aware that case inflections can countermand basic word-order strategies in sentence processing, but they have not yet mastered the necessary inflectional strategies to allow them to identify grammatical relations on the basis of inflectional cues alone.

In Table 5 we compare correct performance on the three types of sentences in Serbo-Croatian--object marked, subject marked, and unmarked. It is interesting that performance at the

Table 5

Percentage Correct Response in Serbo-Croatian by Sentence Type

Sentence Type	Age Group			
	A	B	C	D
Neuter-feminine (object marked)	71	54	83	100
Feminine-neuter (subject marked)	67	67	92	92
Neuter-neuter (unmarked)	67	63	73	92

second age level shows a clear drop only for the object-marked sentences, that is, those with clear inflectional cue for direct object. We suggest that these children have begun to realize that there is some relation between a marked accusative noun in a sentence and the possibility of reversed interpretation of the order of nouns in that sentence, but they are not yet clear on the interaction of word order and inflection in their language.

Evidence from performance on a word order comprehension test (Slobin & Bever 1978) reinforces this interpretation. As mentioned above, the same subjects were also asked to act out sentences made up of two nouns and a reversible verb (e.g., The horse kicks the camel). These sentences were presented in all six possible orders of subject, verb, and object, and represented the same three pairings of feminine and neuter nouns as were used in the causative task. At the second age level, performance is significantly different from chance only on those sentences

which provide no inflectional cue to either subject or object--that is, the sentences with two neuter nouns. It is as if the presence of any sort of inflection--subject or object, on either noun--leads to conflicting strategies, resulting in an overall picture of random performance. In the absence of marked inflections, a standard subject-object word-order strategy is followed. By the third age level, inflectional cues aid performance, even making it possible for children to identify an initial object-marked noun as the patient of action. By this age, then, word order and inflectional strategies can operate separately and in interaction with one another. Note in Table 5 that at the third age level it is the inflectionally marked causative sentences which show the greatest increase in correct performance, with the object-marked sentences reaching 100% by the fourth age. This suggests that after the second age level children have become much more proficient at using inflections to aid sentence processing.

Table 5 breaks down error types by age for Serbo-Croatian. It is striking that for the first two age groups, all types of errors are distributed across all three sentence types. This suggests a general confusion in the application of sentence processing strategies to the causative sentences. At the third age level, however, although the numbers are small, a pattern seems to be present. Most of the errors, as pointed out above, are due to the unmarked, neuter-neuter sentences; and here the errors are all of the reversal type--that is, taking the second noun to be instigator. These are the only sentences with no inflectional cues, and it may well be that by this age children rely on such cues above word order in sentence processing. Left with two unmarked nouns in memory, the Serbo-Croatian child may be less clear about the grammatical relations between these two nouns than a child speaking a strict word-order language. That is to say, when short-term memory difficulties happen to leave a Serbo-Croatian child with only word-order information, lacking the customary local cues, s/he may have special difficulty in processing word-order cues alone. However, such reversal errors do include both animals in a causative interaction, reflecting Serbo-Croatian children's generally high level of control of this construction. By contrast, English and Italian errors tend to be noncausative, simply having one animal (usually the second) act alone, reflecting a lower level of comprehension of this structure.

The other significant age-by-language contrast involves the contrast between the Serbo-Croatian and Italian quadratic trends.

Part of this is due to the lowered performance of the Serbo-Croatian children at the second age level just discussed, but part is due to the lack of continued development by the Italian children at the last two ages after a steep early rise in performance. It is not the case that only a few children are committing most of the errors at these later stages in Italian. At the oldest age level, 7/11 of the Italian children made one or more errors.

The nature of the curve in the Italian data may be due to several factors. Some of these may explain why the English growth curve does not have the same nonlinearity as the Italian curve. In both languages, the causative is expressed syntactically, requiring that the whole sentence be attended to, as we noted above. Consequently, performance at the first age level is quite poor, probably as a result of processing limitations. However, the word-order properties of the causative in Italian--Noun, Compound Verb, Noun--may make the nature of the action (i.e., who is the agent of the causative action) more unambiguous than in English, where the Noun, Verb, Noun, Verb order may be more confusing. The continued errors at later ages by both word-order languages may be due to two different factors. (As in Italian, many English-speaking children--9/12--continue to make errors at the oldest age level.) The form of the compound verb in Italian is homonymous with one form of the imperative. Thus older Italian children may be hearing the sentences as, for example, The horse. Make run the camel. In fact, most of the errors in the Italian children at these later ages involved either (1) having the second-named participant perform the action, or (2) touching the first-named participant and then having the second act. Considering the nature of the task--performing actions according to the specifications of the examiner--hearing the sentences as imperatives seems not to have been a bad guess on the part of these children. While errors of having only the second animal act were also made by older English-speaking children, they did not include the component of touching the first-named participant. But it is evident that the particular word-order configurations of the causative constructions pose problems to both Italian and American children throughout the age range tested. In this regard it should be noted that neither of these groups reach the ceiling of near-perfect performance evidenced by the Yugoslav and Turkish children.

In summary, the results of our causative comprehension study suggest that sentence processing is especially aided by what we have called local cues--that is, surface markings which

identify the roles of particular words, such as case inflections on nouns and particles affixed to or immediately adjacent to verbs. More difficult for processing are constructions which require that one hold an entire sentence pattern in memory, such as is required for the application of word-order rules. The acquisition of a system of local cues can, at points, be retarded in languages where both word-order and inflectional cues operate to express the same grammatical relations, as in Serbo-Croatian. In this case, two types of strategies must be kept available. However, the existence of local cues still facilitates Serbo-Croatian sentence processing overall.

FOOTNOTES

[1]This study is part of the Berkeley Cross-Linguistic Acquisition Project (Dan I. Slobin, Principal Investigator), carried out with generous and appreciated support from the William T. Grant Foundation to the Institute of Human Learning and from NIMH to the Language-Behavior Research Laboratory of the University of California. The investigation was designed in collaboration with Ayhan Aksu, Francesco Antinucci, Thomas G. Bever, Susan Ervin-Tripp, Judith R. Johnston, and Ljubica Radulović. We gratefully acknowledge the labors of our testers: Penny Boyes-Braem, Judith R. Johnston, and Gail Loevenstein Holland in the United States; Rosanna Bosi and Wanda Gianelli in Italy; Ljubica Radulović and Emilia Zalović in Yugoslavia; and Ayla Algar and Alev Orhon in Turkey.

[2]There are actually several different forms of the causative particle in Turkish. In this study we used the most common form, -dir- (koştur- 'make run', yüzdür- 'make swim', yattır- 'make lie down'), and the reduced form -t-, used with polysyllabic verb stems ending in a vowel (atlat- 'make jump', yurut- 'make walk', uyut- 'make sleep'). There were no differences in results for the two forms of the morpheme, and the data for the two forms are presented together.

[3]The same is true of masculine inanimate nouns in the singular, and neuter and feminine nouns in the plural. Only singular neuter and feminine nouns were used in this study.

[4]A full summary table of all of the contrasts performed is available on request.

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